

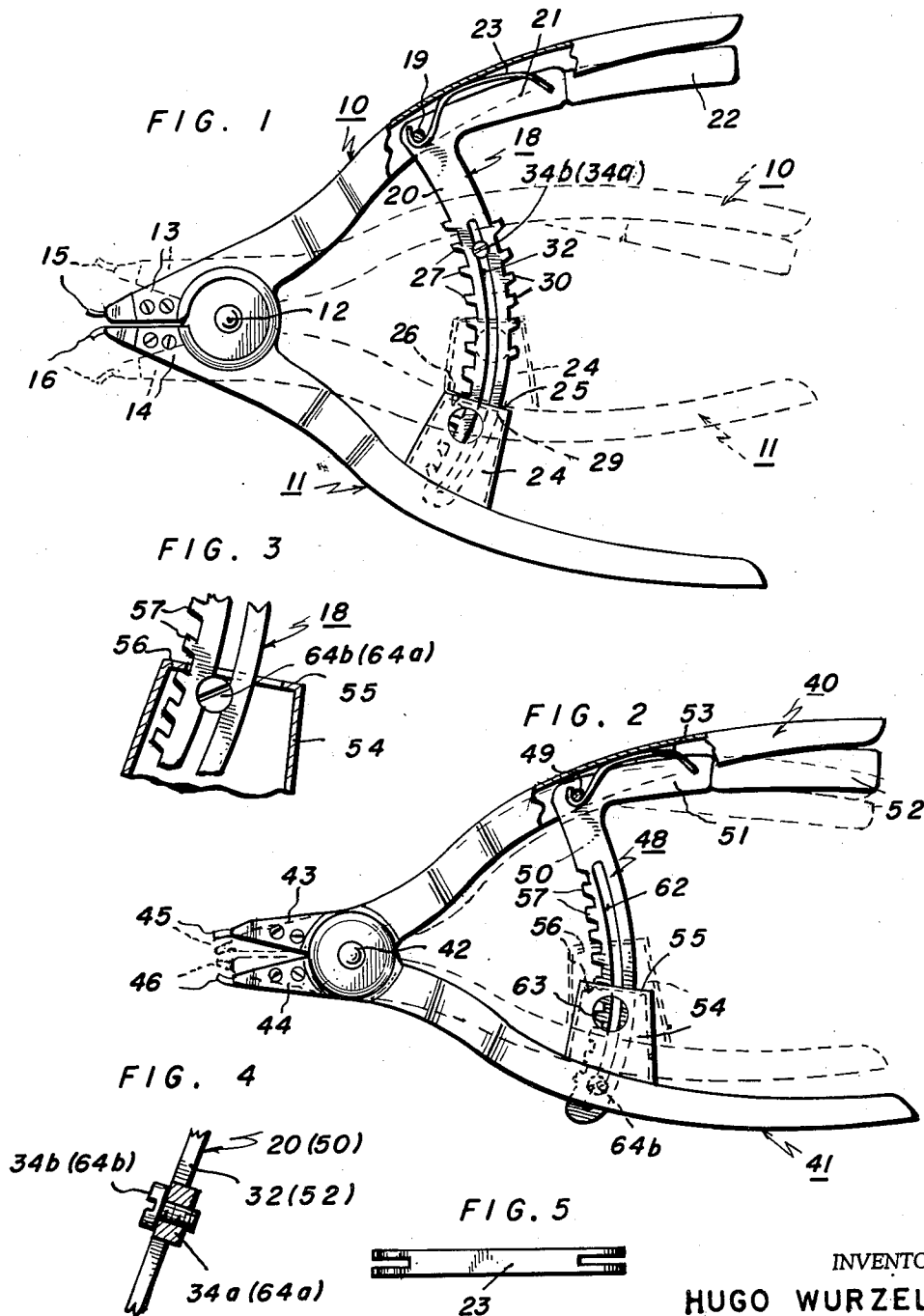
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TOOLS FOR HANDLING SPLIT SPRING RETAINING RINGS

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TOOLS FOR HANDLING SPLIT SPRING RETAINING RINGS

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This invention relates to improvements in tools for handling split spring retaining rings, and more particularly to an improved pliers-type tool of the general class disclosed and claimed in Feitl et al. Patent No. 2,439,785, dated April 13, 1948, for spreading or contracting such rings, depending on whether they are external or internal rings, and thereupon assembling them in their shaft- or housing-bore grooves.

Stated broadly, it is an important object of the present invention to provide a pliers-type tool having pawl and ratchet means for preventing uncontrolled opening of the plier handles under the bias of the spread or contracted spring retaining rings with which the tool is engaged, with limit-stop means serving a highly useful purpose. To explain, in the tool for spreading external split retaining rings during assembly thereof, the novel limit-stop means of the invention serves to limit the contraction (closing) of the tool handles and hence to amount that the ring can be spread, and thus protects against ring over-spreading. On the other hand, in the tool for contracting internal split retaining rings during assembly thereof, the novel limit-stop as herein proposed serves to insure uniform angular position and spacing of the plier tips with full opening of the tool handle, thus facilitating the coupling of the tool to internal rings of the same size to be assembled in quantity.

More particularly, an object of the present invention is the provision of an improved pliers-tool for use with external split spring retaining rings having pawl and ratchet means generally similar to that disclosed and claimed in the aforesaid Feitl et al. Patent No. 2,439,785 for preventing self-opening of the tool during a ring spreading and assembling operation which is characterized by simple yet thoroughly dependable and readily adjustable means for limiting the closing movement of the tool handles and thereby the amount that the ring engaged by the tips of the tool can be spread, thus to prevent overspreading of said ring which may cause same to take on a permanent set.

Another object of the invention is the provision of an improved pliers-type tool for use with internal split retaining rings incorporating pawl and ratchet means generally according to that disclosed and claimed in the aforesaid Feitl et al. Patent No. 2,439,785 for preventing self-opening of the tool handles during a ring contracting and assembling operation, characterized by the inclusion of simple yet thoroughly dependable and readily adjustable means for setting the maximum amount that the tool points can be spread to correspond to that of the spacing between the open ends of the internal rings being assembled in their unstressed state, thereby to avoid the necessity of manually determining the spacing of the tool points preliminary to their engagement with each ring to be assembled.

A more specific object of the invention is the provision of a tool for use in assembling internal split spring retaining rings incorporating both pawl and ratchet means and limit-stop means as last aforesaid, wherein the ratchet guide sleeve which also mounts the pawl of the pawl and ratchet mechanism is provided with a window which is so positioned and arranged as to permit accurate setting of the limit-stop means in a selected position of adjustment along the length of the ratchet arm or segment, as

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in turn determines the maximum amount that the tool points can be opened with each full opening of the plier handles.

The above and other objects and features of advantage of the improved pliers-type tool for handling split spring retaining rings during the assembly thereof according to the present invention will appear from the following detailed description, in which reference is had to the accompanying drawings which illustrate practical embodiments of such a tool, wherein—

FIG. 1 is a plan view, with certain parts broken away, of a tool according to the invention for spreading and assembling external split spring retaining rings, the tool being shown in both the full open position (full lines) wherein its handles are spread and its working points disposed close to one another for insertion thereof into the apertured ears conventionally formed on such external rings, and in the closed position (broken lines) wherein its handles are contracted and its working points are spread as effects spreading of the ring with which the tool is coupled;

FIG. 2 is a plan view generally similar to FIG. 1 but illustrating a tool according to the invention for contracting and assembling internal split spring retaining rings, the view in full lines illustrating the tool in the partially full-open position of both tool handles and tool working points, and in broken lines illustrating both the tool handles and the tool points fully contracted;

FIG. 3 is an enlarged opened-up view of the ratchet-arm guide sleeve which illustrates both the ratchet and pawl and the limit-stop means in active positions and more particularly said limit-stop means in a position in which it is performing its function of determining maximum opening of the tool handles, as in turn determines the maximum spreading of the tool tips and their working points;

FIG. 4 is a section taken along lines *a—b* of both FIGS. 1 and 2, which illustrates the detailed structure of the limit-stop means; and

FIG. 5 is an upper-face plan view of the ratchet-member biasing spring preferably employed in the FIGS. 1 and 2 forms of tool.

Referring to the drawings, the tool for handling external spring retaining rings according to FIG. 1 is basically the same as the tool serving generally similar function according to the aforesaid Feitl et al. Patent No. 2,439,785. That is to say, it comprises a pair of generally parallel lever arms 10, 11 pivotally interconnected near their forward ends by means of a pivot 12, said forward ends mounting tool tips 13, 14 which terminate at their free ends in pin-like working points 15, 16 which are adapted to be projected into the apertures conventionally provided in the eared ends of split spring retaining rings of the external type which are to be assembled in the grooves of shafts, spindles, pins, and similar workpieces. The longer rearward ends of said lever arms have divergent curvature so that they may function as tool handles, and their length is sufficient as to provide the leverage for closing the handles against the substantial tension of the relatively large-size retaining rings to be assembled, for example.

At least the handle end of the lever arm 10 is formed with hollow channel section, and it mounts a generally L-shaped ratchet member generally designated 18 by means of a pivot pin 19 affixed in the handle sides as illustrated. Said ratchet member 18 comprises a ratchet segment 20 extending towards the other tool arm 11 and a rearward extending arm 21 operating in the channel of the handle 10 rearwardly of the pivot pin 19 which mounts the ratchet member as a whole. Preferably, said extending arm 21 connects at its rearward end to a ratchet operating handle 22 which is biased to an accessible position

without the handle 10 by means of a leaf spring 23 hooked to the pivot pin 19 and reactive between said pin and the outer end of the ratchet-member arm 21, thereby normally to bias the ratchet member 18 as a whole in clockwise direction. As seen in FIG. 5, the spring 23 has both ends bifurcated and it straddles the ratchet arm 21, thus also serving to center said arm within the handle-arm channel.

The free end of the ratchet segment 20 extends through an opening provided in the inner end wall 25 thereof, into a sleeve-like guide member 24 which is affixed to the inner side of the companion tool arm 11 and reaches towards the aforesaid tool arm 10. In addition to providing a guide for said ratchet segment, said sleeve also mounts on said sleeve end wall 25 at least one pawl 26 adapted to cooperate with the ratchet teeth 27 provided along the inner side edge of said ratchet segment, and it may also mount a second pawl 29 if said ratchet segment is also provided with teeth 30 along its outer side edge as well. If said outer-edge teeth are provided, they will preferably be staggered with relation to the inner-edge teeth 27.

With the construction so far described, it will be understood that as the handle ends of the tool arms 10, 11 are moved in closing direction, i.e. towards one another, ratchet segment 20 moves into the guide sleeve 24, during the course of which movement both the inner- and outer-edge teeth 27, 30 thereof ride over the pawls 26, 29. However, in any in-between or in the fully closed position of the handles, the latter are normally secured against self-opening movement under the tension of the ring which has been spread consequent to the spreading motion of the tool points 15, 16 engaged with the apertured ends of said ring in the conventional manner, by engagement of pawl 26 with one of the ratchet teeth 27. However, when controlled opening of the tool whose points are engaged with the ring and corresponding release of said ring is desired, it is only necessary to "pump" the operating ratchet handle 22 in opposite directions as effects limited back and forth rocking motion of the ratchet member 18 and a controlled opening of the handles under the action of the pawls 26 and 29 and ratchet teeth 27 and 30, all as explained in the aforesaid Feitl et al. Patent No. 2,439,785.

According to the invention limit-stop means for limiting the extent of closing of the tool handles 10, 11 and the corresponding opening of the tool points 15, 16 is provided. As illustrated in FIG. 1, such comprises an arcuate slot 32 cut or otherwise formed in the ratchet segment 20 to extend therealong, and a stop nut and screw combination 34a and 34b best seen in FIG. 4, of which the nut is provided with a guide rib projecting into said slot, and whose position along the slot 32 may be adjusted as desired by the simple expedient of loosening the screw 34b, shifting the nut and screw combination to a desired position along said slot, and thereupon retightening the screw with respect to the nut to fix the position of the latter along the slot. Should it be desired to establish a permanently fixed position of the limit-stop means along the slot 32, such can be accomplished simply by peening the end of the screw shank over the outer end face of the bolt 34a. It will of course be understood that the lateral extent of the nut and screw combination with respect to the thickness of the ratchet segment 20 is such that, as said segment moves into the guide sleeve 24, the screw and nut will abut against the outer face 24a of the closed end of said sleeve, thus to prevent further movement of the segment into the sleeve and thereby fixing the amount that the pliers can be closed. However, said limit stop means in nowise interferes with the step-by-step opening movement of the pliers under the control of the ratchet member 18 as a whole. Thus it will be seen that the invention provides an exceedingly simple, thoroughly dependable and easily adjustable means for limiting the closing motion of the handles of pliers designed for use with external split spring retaining rings, as

achieves the desirable result of preventing overspreading of said rings.

Referring now to FIGS. 2 and 3, which illustrate the limit stop means of the invention applied to a tool for handling internal split spring retaining rings which is provided with means in the form of a pawl and ratchet for preventing uncontrolled closing movement of the plier handles under the tension of a contracted ring being assembled in a housing bore groove, for example, such a tool is as usual characterized by crossed lever arms 40, 41 rather than with parallel arms as described for the tool shown in FIG. 1. Accordingly, as the handle ends of said arms are compressed, the forward ends 43, 44 of said arms, which carry the tool tips 43, 44 and their working points 45, 46 (which latter are normally spread apart) move together thereby to contract an internal ring in whose ear apertures the aforesaid working points 45, 46 have been inserted. As with the FIG. 1 form of tool, the aforesaid basic tool is provided with pawl and ratchet means 48-57 inclusive (corresponding to the ratchet means 18-27 of the prior described tool) for preventing uncontrolled opening of the tool handles under the tension of the contracted internal ring being assembled thereby, it being observed that ratchet teeth designated 57 are provided along only one i.e. the forward, side edge of the segment 50, rather than along both edges as with the prior described tool.

According to the present invention, the pliers-type tool for use with internal rings as aforesaid is also provided with limit-stop means comprising an arcuate slot 62 provided in and extending along the length of the ratchet segment 50 and a stop nut and adjusting screw combination 64a, 64b (FIG. 4) corresponding to the limit stop means previously described. However, said limit-stop means when applied to the tool for handling split internal rings as herein proposed serves a different purpose than the previously described limit-stop means, such being to insure uniform angular position of the working tips 43, 44 and their points 45, 46 with full opening of the tool handles. Accordingly, said limit-stop means is affixed to the outer end of the ratchet segment 50 and hence is disposed outwardly of the inner end wall 55 of the segment guide sleeve 54. Thus, as seen in FIG. 3, the stop nut and screw 64a, 64b combination is adapted to bear against the relatively outer side or face of the inner end wall of said guide sleeve (rather than the inner side as in FIG. 1) when the tool handles are moved to their full open position. Such of course results in the tool working points 45, 46 being spread a uniform maximum amount with each full opening of the tool handles, and hence the tool may be coupled to a succession of rings of the same size without manually adjusting the spacing between the working points 45, 46 other than to fully open the tool handles, for each ring-engaging operation.

According to a further feature of the invention, the aforesaid guide sleeve 54 is provided in its side wall immediately adjacent its end wall 55 with a window 63 which opens to the sleeve interior at a part thereof closely adjacent the under side of said sleeve end wall and directly above the ratchet segment operating therein. This window 63 enables the stop nut and screw to be affixed to the ratchet segment 50 from within the sleeve 54 in a selected position such that it will abut the under face of said sleeve end wall 55 when the tool handles have been opened an amount as spaces the working points 45, 46 to the particular size of rings being assembled. Thus, the incorporation of the limit-stop means as aforesaid into the tool for handling internal rings of the type under discussion substantially facilitates the ring assembly operation, since it provides a means for preliminarily setting the spacing between the tool points 45, 46 so that it corresponds to the spacing between the eared apertures of a plurality of the internal rings of the size range being assembled at any one time.

Without further analysis, it will be seen that the im-

proved pliers-type tool for handling split spring retaining rings as described and illustrated achieves the objectives of the invention as explained in the foregoing. However, as many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A pliers-type tool for handling split spring retaining rings during their assembly in the grooves of shafts, housing bores and the like comprising, in combination, a pair of lever arms pivotally interconnected intermediate their ends for relative angular motion, the ends of the arms extending to one side of the point of their connection mounting plier tips and the opposite ends being formed as tool handles adapted to be manually brought together, pawl and ratchet means for preventing uncontrolled self-opening of said handle ends under the tension of a ring with which the tool is engaged including an elongated ratchet segment pivotally connected to one handle end and extending towards the other said end and a guide sleeve affixed to the other handle end having an end wall provided with an opening through which said segment moves as said handle ends swing towards and away from one another and mounting fixed pawl means cooperatively related to said ratchet segment, and limit-stop means operative between the segment and the sleeve end wall for limiting relative angular motion of said handle ends and thereby the spacing of the plier tips, said last means comprising an elongated arcuate slot provided in the segment and a stop nut and a securing screw combination operative in the slot and being adapted to be secured in a desired position of adjustment therealong in which it is adapted to abut said sleeve end-wall.

2. A pliers-type tool for handling split external retaining rings during their assembly in the grooves of shafts and the like comprising a pair of parallel lever arms pivotally interconnected to one another intermediate their ends, the ends of the arms extending to one side of the point of connection mounting plier tips and the opposite ends of the arms being formed as tool handles adapted to be manually brought together, pawl and ratchet means for preventing uncontrolled self-opening of said handle ends under the tension of a ring engaged by said plier tips and which has been spread by movement of said tips away from one another, said means including an elongated ratchet segment pivotally mounted on one handle end and extending towards the other handle end, a guide sleeve affixed to said other handle end and extending towards said one handle end and having an inner-end wall

provided with an opening through which said segment moves as said handle ends swing toward and away from one another and said end wall further mounting fixed pawl means cooperatively related to said ratchet segment, and limit-stop means for limiting the closing movement of said handle ends and thereby fixing the maximum spacing of the plier tips and the maximum spreading of a ring being assembled, said last-named means comprising an elongated slot provided in the segment and a stop nut and securing screw combination extending through the slot and adapted to be secured to the segment in a selected position of adjustment along the slot and in which it is adapted to abut the side of the sleeve end-wall which is disposed towards said one handle.

3. A pliers-type tool for handling split internal retaining rings during their assembly in the grooves of a housing bore and the like comprising a pair of crossed lever arms pivotally interconnected to one another at approximately their point of crossing, the ends of the arms extending to one side of the point of connection mounting plier tips and the opposite ends of the arms being formed as tool handles adapted to be manually brought together, and pawl and ratchet means for preventing uncontrolled self-opening of said handle ends under the tension of a ring engaged by said plier tips and which has been contracted by movement of said tips towards one another, said means including an elongated ratchet segment pivotally mounted on one handle end and extending towards the other handle end, a guide sleeve affixed to said other handle end and having an inner-end wall provided with an opening through which said segment moves as said handle ends swing toward and away from one another and mounting fixed pawl means cooperatively related to said ratchet segment, limit-stop means for maintaining a fixed spread relation of the working points for each full opening of the handle ends comprising an elongated slot provided in the segment and a stop nut adapted to be secured to the segment at a selected position of adjustment along the slot, said sleeve being provided with a window opening to sleeve interior immediately adjacent said end wall, the construction and arrangement being such that the stop nut may be affixed to the segment through said window in a selected position of adjustment therealong as determines the maximum opening permitted said handle ends.

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